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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/686,601	10/11/2000	Pietro Buttolo	200-0031	5036

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EXAMINER

BRODA, SAMUEL

ART UNIT PAPER NUMBER

2123

DATE MAILED: 04/01/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

SL

Office Action Summary

Application No.

09/686,601

Applicant(s)

BUTTOLO ET AL.

Examiner

Samuel Broda

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 October 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 October 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>3</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

1. Claims 1-20 have been examined.

Information Disclosure Statement

2. The Information Disclosure Statement by Applicant ("IDS"), Paper No. 3, listed Cheng et al, "Real-Time Four-Dimensional Collision Detection for an Industrial Robot Manipulator," but only a copy of its Abstract appeared in the publications submitted with the IDS. A copy of this publication was located by the Examiner and the citation is listed on the Form PTO-892 "Notice of References Cited" included with this Office Action.

Drawings

3. The formal drawings submitted on 26 October 2000 are objected to for the following reason: Fig. 3A of the formal drawings omits the advancement of the methodology to circle "D" at reference identifier 135. In the informal drawings submitted by Applicants and in the Specification at page 21 lines 12-14, the methodology advances to circle "D" at reference identifier 135. Therefore, in the formal drawings, there is no manner for any of the remaining flowcharts of Figs. {3A, 3B, 3C, 3E} to ever branch to Fig. 3D. Correction is required.

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Abstract

4. The abstract of the disclosure is objected to because it does not appear to indicate the conditions that determine the detection of the collision between the models: Correction is required.

Claim Objections

5. The following is a partial quotation of 37 CFR § 1.75:

(a) The specification must conclude with a claim particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention or discovery.

5.1 Claims 9 and 14 are objected to under 37 CFR § 1.75(a) because line 14 of claim 9 and line 15 of claim 14 use the term “triangle.” whereas the proper term appears to be “triangle;”. Additionally, the text of claim 14 does not appear to terminate with a period. Correction is required.

Claim Rejections - 35 U.S.C. § 112, Second Paragraph

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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6.1 Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Regarding claims 1-8, the preamble of independent claim 1 is directed to “A method of real time collision detection between geometric models” and it is unclear in the limitations which geometric models are considered for collision detection. For example, the first limitation identifies the “mesh model of the geometric model” which appear to describe the same object and no other geometric model appears to be identified in the remainder of the claim.

6.2 Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01.

Regarding independent claims 1, 9, and 14, the preamble of each claim is directed to “A method of real-time collision detection” but none of the step limitations appears to describe when a collision is detected or the conditions that cause a collision to be detected.

6.3 Dependent claims not specifically described above are rejected using the same analysis.

Claim Rejections - 35 U.S.C. § 101

7. The following is a quotation of 35 U.S.C. 101:

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Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7.1 Method claims 1-7 and 9-12 are rejected for reciting a process comprising an abstract idea.

7.2 Regarding independent claims 1 and 9, claim 1 is directed to “A method of real time collision detection between geometric models” and claim 9 is directed to “A method of real time collision detection with a geometric model of a vehicle” and steps recited in each claim describe the abstract idea of comparing tracking points to triangles.

These steps do not:

- (1) recite data gathering limitations or post-mathematical operations that might independently limit the claims beyond the performance of a mathematical operation; or
- (2) limit the use of the output to a practical application providing a useful, concrete, and tangible result, such as calculating a force of the new tracking point that is used to replicate a feeling of contact with a rigid object.

7.3 Claims 2-7 are dependent on claim 1 and rejected using the same analysis; claims 10-12 are dependent on claim 9 and rejected using the same analysis.

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Claim Rejections - 35 U.S.C. § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

...

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

8.1 Claims 1-8 are rejected under 35 U.S.C. 102(e) as being anticipated by Basdogan et al, U.S. Patent 6,704,694, issued 9 March 2004 and filed 15 October 1999, and claiming priority to the date 16 October 1998 based on a provisional application.

8.2 Regarding claim 1, Basdogan et al teaches a method of real time collision detection between geometric models, including:

identifying a current tracking point of a force feedback device colliding with a mesh model of the geometric model [Fig. 4 steps 90 – 94 with probe of haptic device corresponding to current tracking point] and identifying a current triangle associated with the current tracking point, wherein the force feedback device is operatively connected to a computer system [Fig. 5 step 114 and corresponding text at column 16 line 3 through column 18 line 10; current tracking point P_1 and time t_1 and current triangle defined by vertices P_a , P_b , and P_c ; column 16 lines 26-30];

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determining a new tracking point of the force feedback device colliding with the mesh model by approximating the new tracking point from the current tracking point and the current triangle [new tracking point corresponding to point P_2 at time t_2 ; column 14 lines 26-30]; and

determining a state of the new tracking point using the new tracking point and the state of the previous tracking point, wherein the state is inside, on an edge or on a vertex of either the current triangle or a new triangle [state of new tracking point determined with plane calculated from current triangle using calculation of calculation of dot products, calculation of intersection point, and calculation of edge crossing; column 16 line 22 through column 18 line 10]; and

using the state of the new tracking point to determine if a predetermined condition is met to conclude that the new tracking point is on the current triangle or if another predetermined condition is met to conclude that the new tracking point crossed to a new triangle, wherein the new triangle is connectively associated with the current triangle [method of computing dot products and intersection point is repeated for all polygons in object; see Fig. 5 steps 114 and 118; new tracking point will only intersect with one triangle (corresponding to the new triangle) because the object is convex].

Therefore, Basdogan et al anticipates claim 1.

8.3 Regarding claims 2-7, the method of Basdogan et al necessarily includes all limitations corresponding to claims 2-7 in its method of calculating the plane defined by the current triangle and comparing it to the line formed by the old tracking point and new tracking point.

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8.4 Regarding claim 8, the method of Basdogan et al includes calculation and application of a force replicating feeling of contact with an object. See Fig. 4 step 100, Fig. 14 and corresponding text at column 23 lines 13-67.

Claim Rejections - 35 U.S.C. § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9.1 Claims 9-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Basdogan et al, in view of common knowledge regarding initialization of computer simulations.

9.2 Regarding claim 9, this independent claim includes the limitation “setting a state of the current tracking point to inside,” with all other limitations, including reference to projecting the tracking point onto a plane defined by the current triangle, taught by Basdogan et al and described in the rejection of claim 1 above.

Regarding independent claim 14, this independent claim includes the limitation “setting a state of the current tracking point to inside,” with all other limitations, including reference to projecting the tracking point onto a plane defined by the current triangle, taught by Basdogan et al and described in the rejection of claims 1 and 8 above.

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Basdogan et al does not appear to explicitly disclose the initial conditions for setting the current tracking point at the start of the simulation, although Basdogan et al does state at column 13 lines 2-9 that:

... It should be noted that where computer software can be used, many routine program elements, such as initialization of loops and variables and the use of temporary variables are not shown. It will be appreciated by those of ordinary skill in the art that unless otherwise indicated herein, the particular sequence of steps described is illustrative only and can be varied without departing from the spirit of the invention.

9.3 Regarding claims 9-20, Official Notice is taken that initialization of a software method corresponding to setting a state of the current tracking point to inside is old and well known in haptic interface simulations. Such an initialization state would correspond to the physical situation of having a probe resting against the object at the commencement of measurements. Such a physical situation spares the user from physically moving the probe to the object.

Regarding claims 9-20, it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to initialize the simulation of Basdogan et al with the tracking point set to inside and corresponding to the force feedback device colliding with the model, because such an initialization would more accurately model the typical use of a probe and would spare the user from finding the tracking point in the virtual space and moving it into contact with the model.

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Conclusion

10. The prior art made of record and not relied upon is considered pertinent to Applicants' disclosure. Reference to Tarr, U.S. Patent 6,191,796, is cited as teaching a method for haptically deforming a virtual surface.

Reference to De Floriani et al, "On-line Space Sculpturing for 3D Shape Manipulation," IEEE International Conference on Pattern Recognition, Vol. 1, pp. 105-108 (September 2000), is cited as teaching a triangular mesh and 'focus' method having application in robotic arm modeling. See pages 107-108.

Reference to Erickson et al, "Separation-Sensitive Collision Detection for Convex Objects," Proceedings of the 10th Annual ACM-SIAM Symposium on Discrete Algorithms, pp. 327-336 (1999), is cited as teaching polygon approximation hierarchies.

11. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Samuel Broda, whose telephone number is (703) 305-1026. The Examiner can normally be reached on Mondays through Fridays from 8:00 AM – 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Kevin Teska, can be reached at (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.



**SAMUEL BRODA, ESQ.
PRIMARY EXAMINER**